

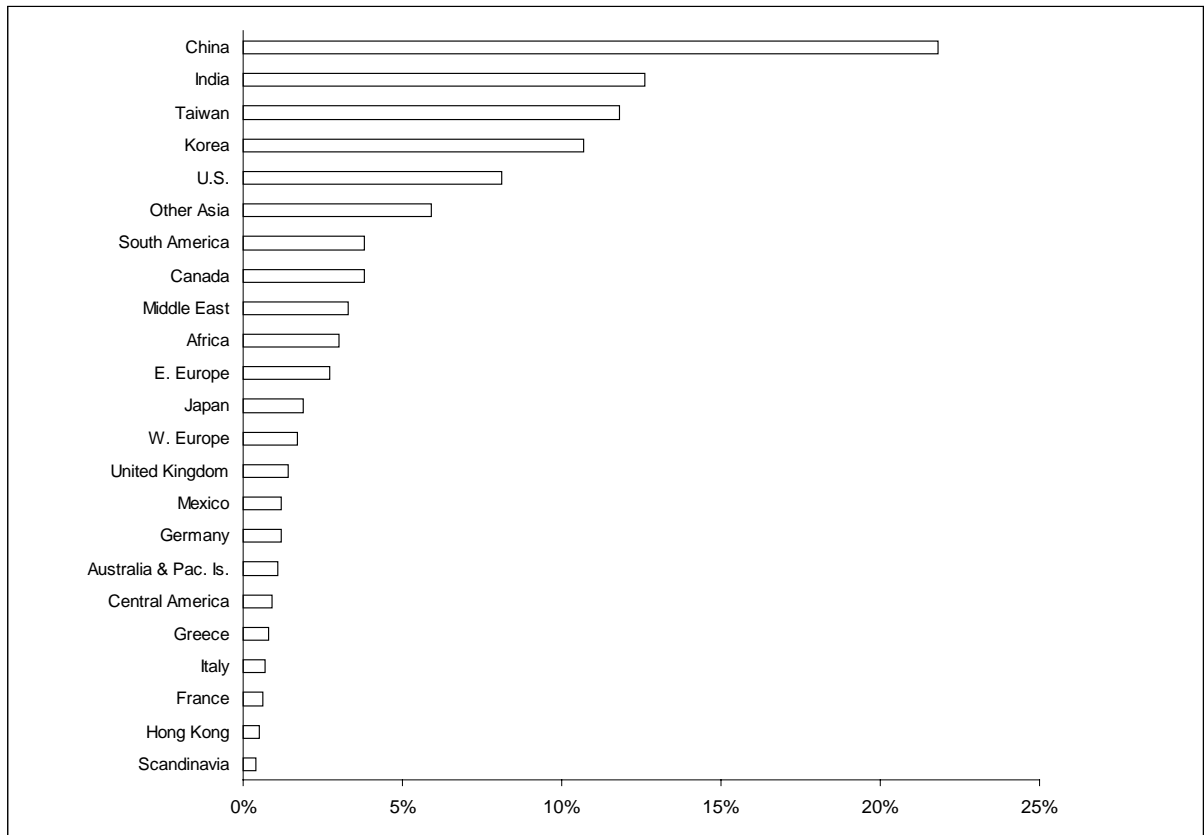
## A Profile of International Students

As noted in the main section of this report, the higher than normal non-response rate to the citizenship question on the 1997 Survey of Earned Doctorates makes some of the percentages and trends difficult to know with sufficient certainty. These data include the number and distribution of non-U.S. citizen doctorate recipients, the one-year and five-year trends, distributions by country and/or institution, and post-graduation plans. The 1997 total of 3,647 (8.5 percent) missing citizenship identifiers exceeds the previous high of 2,652 (7.7 percent) in 1989. However, as discussed below, careful examination and manipulation of the summary figures offer acceptably reliable information for some data series, including the areas noted. In addition, this section contains material not found in previous summary report discussions or tables.

**Demographic Profile.** The vast majority of non-U.S. citizens who received their doctorates from U.S. universities began their college careers outside the United States, a not unexpected finding. Only 8 percent of non-U.S. citizens who were awarded research doctorates in 1997 began their undergraduate studies at a U.S. college or university. In absolute numbers, however, that means approximately 1,000 non-U.S. citizen doctorate recipients started college in the United States. Countries with 25 or more doctorate recipients who also studied in the United States as undergraduates were India (57 recipients), Iran (56), Canada (45), Korea (39), Malaysia (35), China (31), Hong Kong (30), Japan (28), and the United Kingdom (25). Nearly 60 percent began their collegiate studies in Asia (with 22 percent in China, 13 percent in India, 12 percent in Taiwan, and 11 percent in Korea). (See Figure 2-1 and Table 2-1.)

China continues to be the nation of citizenship for the largest number of non-U.S. citizen doctorate recipients. (See Table 14.) India, Taiwan, Korea, and Canada round out the top five countries, and these five account for more than half of all non-U.S. citizen doctorate recipients in 1997. The list of the top 30 countries remains almost identical to that for 1996, with Australia and the Republics of the former Yugoslavia being the only two new entrants (replacing Sri Lanka and Nigeria).

**Figure 2-1**  
**Country/region of undergraduate college entry for 1997 non-U.S. citizen**  
**Ph.D. recipients**

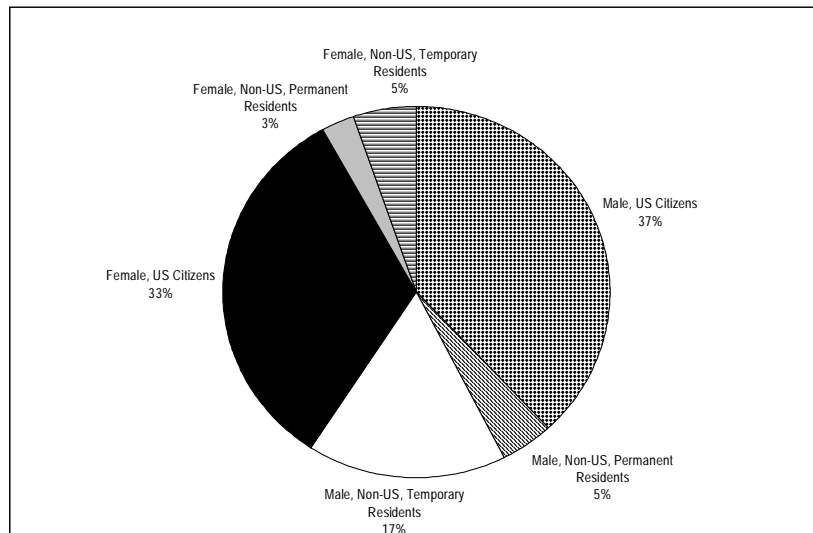


See Table 2-1, Page 72.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

Female non-U.S. citizens have increased their share of all doctorates significantly since 1970. Although large in terms of the percentage increase, in absolute numbers the current level of international females remains relatively small, with non-U.S. women being awarded only 7 percent of research doctorates in 1997. Sex differences are in part related to differences in field of study, where the areas most populated by international students, S & E fields, historically have large concentrations of males. (See Figures 2-2 and 2-3 for the distribution of 1997 doctorate recipients by citizenship status and sex.)

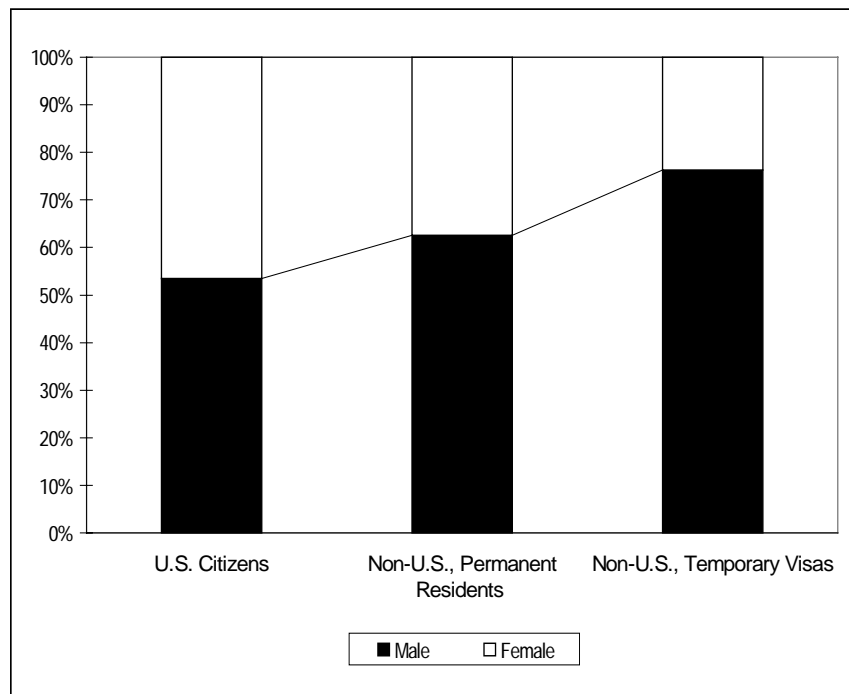
**Figure 2-2**  
**1997 Ph.D. recipients by citizenship status and sex**



See Table 2-2, Page 72.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

**Figure 2-3**  
**Sex of 1997 Ph.D. recipients by citizenship status**



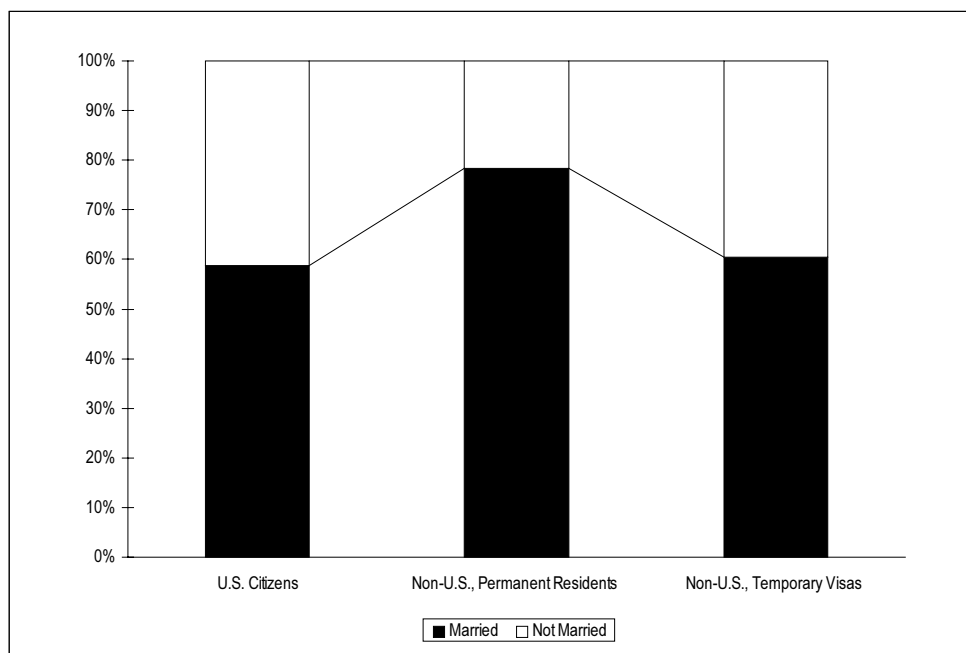
See Table 2-2, Page 72.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

Of those with known marital status, 61 percent of doctorate recipients in 1997 were married (marital status is unknown for 11.4 percent of recipients). Non-U.S. citizens who were permanent residents reported a higher rate of marriage (78 percent) than U.S. citizens (59 percent) or those with temporary visas (60 percent). (See Figure 2-4.)

**Figure 2-4**  
**Marital status of 1997 Ph.D. recipients by citizenship status**

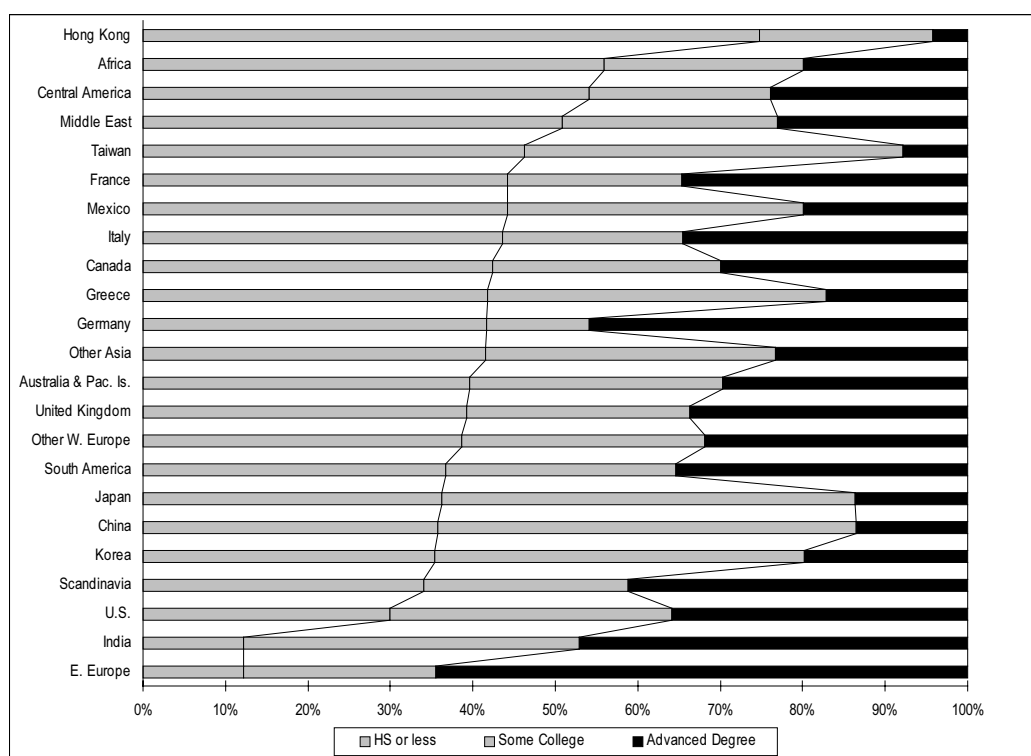
See Table 2-3, Page 72.



SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

Thirty percent of U.S. citizens who earned doctorates in 1997 reported that their fathers had only a high school diploma or had not completed high school; students from Japan and the Scandinavian region reported similar proportions of fathers with a high school education only (36 percent and 34 percent, respectively). Recipients from Western European countries, Australia, and Canada reported higher proportions of fathers with less formal education, ranging from 39-45 percent of respondents who provided information on family educational backgrounds. Doctorate recipients from geographic regions with developing economies—the Middle East, Central America, and Africa—reported the highest proportions of fathers with a high school diploma or less. Perhaps surprisingly, recipients from Hong Kong reported the highest proportion—approximately 75 percent—in this category; China had the same proportion as U.S. citizens. At the other end of the educational spectrum, doctorate recipients from Eastern Europe and India had the smallest proportions of fathers with a high school education or less. (See Figure 2-5.)

**Figures 2-5**  
**Father's educational attainment by country of**  
**citizenship for 1997 Ph.D. recipients**



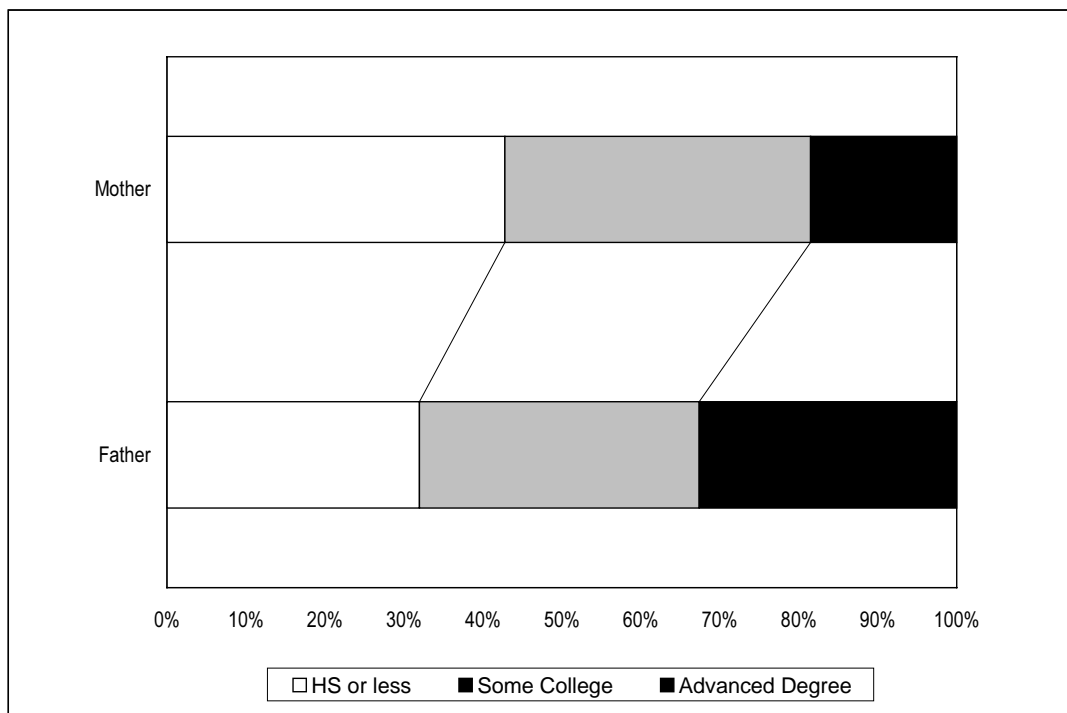
See Table 2-4, Page 73.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

The proportion of fathers with more formal education than high school—those earning an M.A., Ph.D. or professional degree—was 36 percent for U.S. citizens. Scandinavia, Germany, and India exceeded this level, and Eastern European doctorate recipients reported the highest proportion of their fathers with advanced degrees—65 percent.

Regardless of citizenship status, mothers of doctorate recipients have less formal education than the fathers. (See Figure 2-6.) Forty three percent of mothers, compared with 32 percent of fathers, had a high school education or less. Almost twice as many fathers as mothers (33 percent versus 18 percent) had earned advanced degrees. Mothers of doctorate recipients from the United States had, in general, more formal education than mothers of international recipients. Only 37 percent of U.S. doctorate recipients reported that their mothers had a high school education or less; Eastern Europe was the only region with a lower percentage in this category (17 percent). (See Figure 2-7.)

**Figure 2-6**  
**Parents' educational attainment by sex for 1997 Ph.D. recipients**

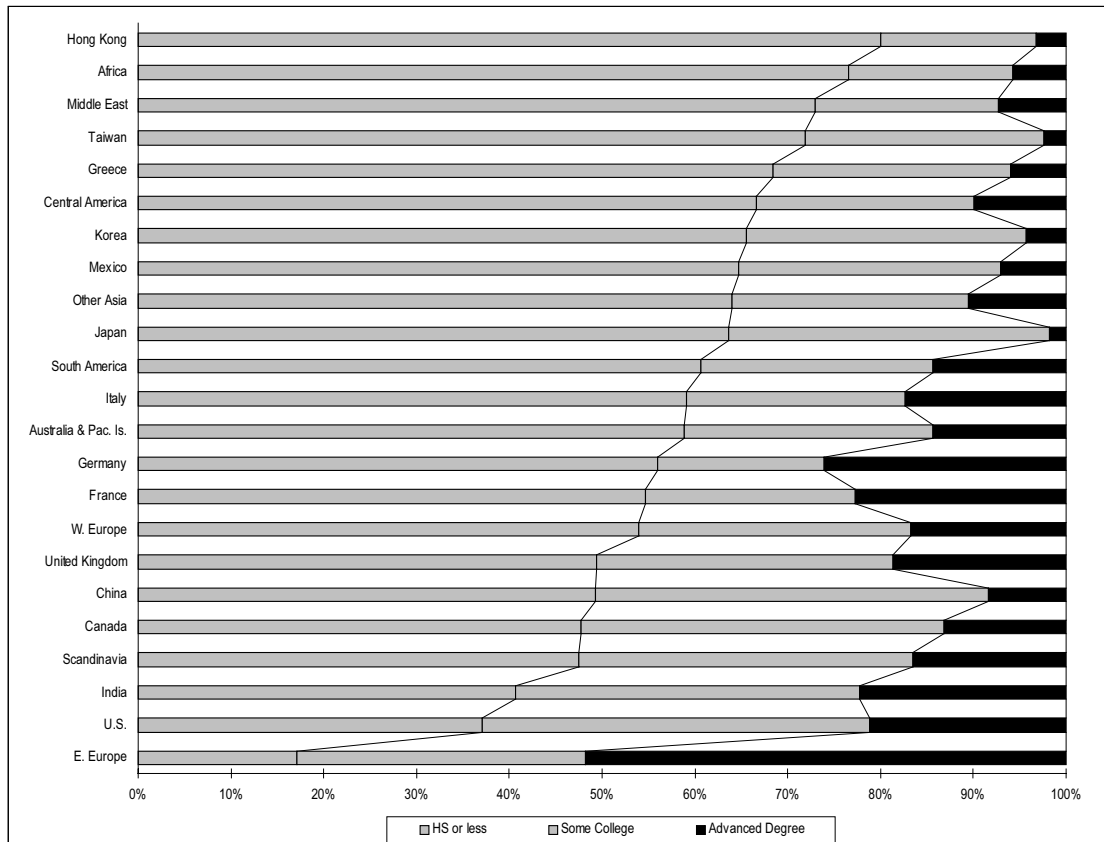


See Table 2-5, Page 73.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

**Totals, Trends, and Distributions.** Table 12 provides basic aggregate and broad-field summary statistics by citizenship. Because of the number of citizenship responses missing, it appears that the number of non-U.S. citizens receiving doctorates declined from 13,275 in 1996 to 11,390 for 1997. In fact, the 1997 figure would then represent the lowest one-year total since 1992 (11,846). As noted in the main report, these conclusions undoubtedly result from the non-response, and a non-response bias, with regard to known citizenship for 1997 doctorate recipients.

**Figure 2-7**  
**Mother's educational attainment by**  
**country of citizenship for 1997 Ph.D. recipients**

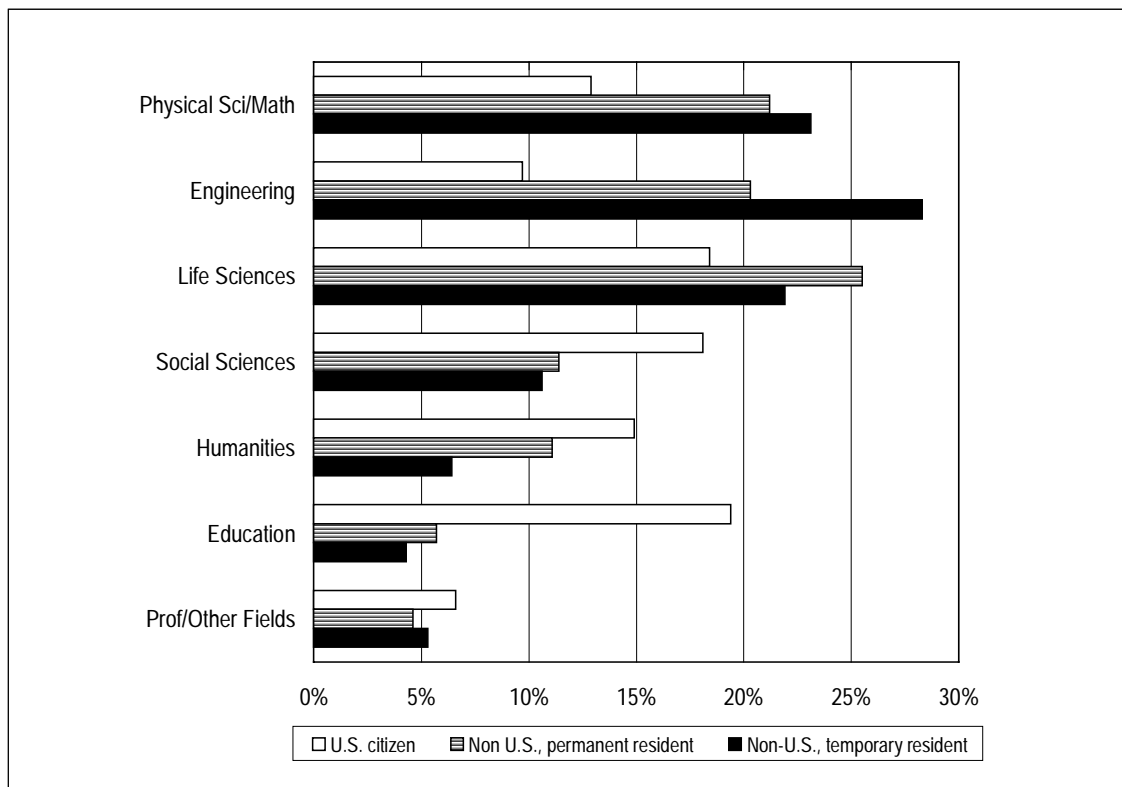


See Table 2-6, Page 74.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

In 1997, the S & E fields granted 65 percent of all doctorates. For U.S. citizens, 59.1 percent of the total doctorates awarded were in those fields; for permanent residents, 78.4 percent of their total were awarded in those fields; and for doctorate recipients on temporary visas, 83.9 percent of their total were in those fields. Within the four S & E categories, the largest number doctorates were granted in the life sciences. For U.S. citizens the largest single field was education, with the life and social sciences close behind. For permanent residents, the life sciences represented the largest broad field of study, followed by the physical sciences and engineering. Temporary visa holders earned more degrees in engineering, then the physical and life sciences. (See Figure 2-8).

**Figure 2-8**  
**Broad field of study by type of citizenship for 1997 Ph.D. recipients**



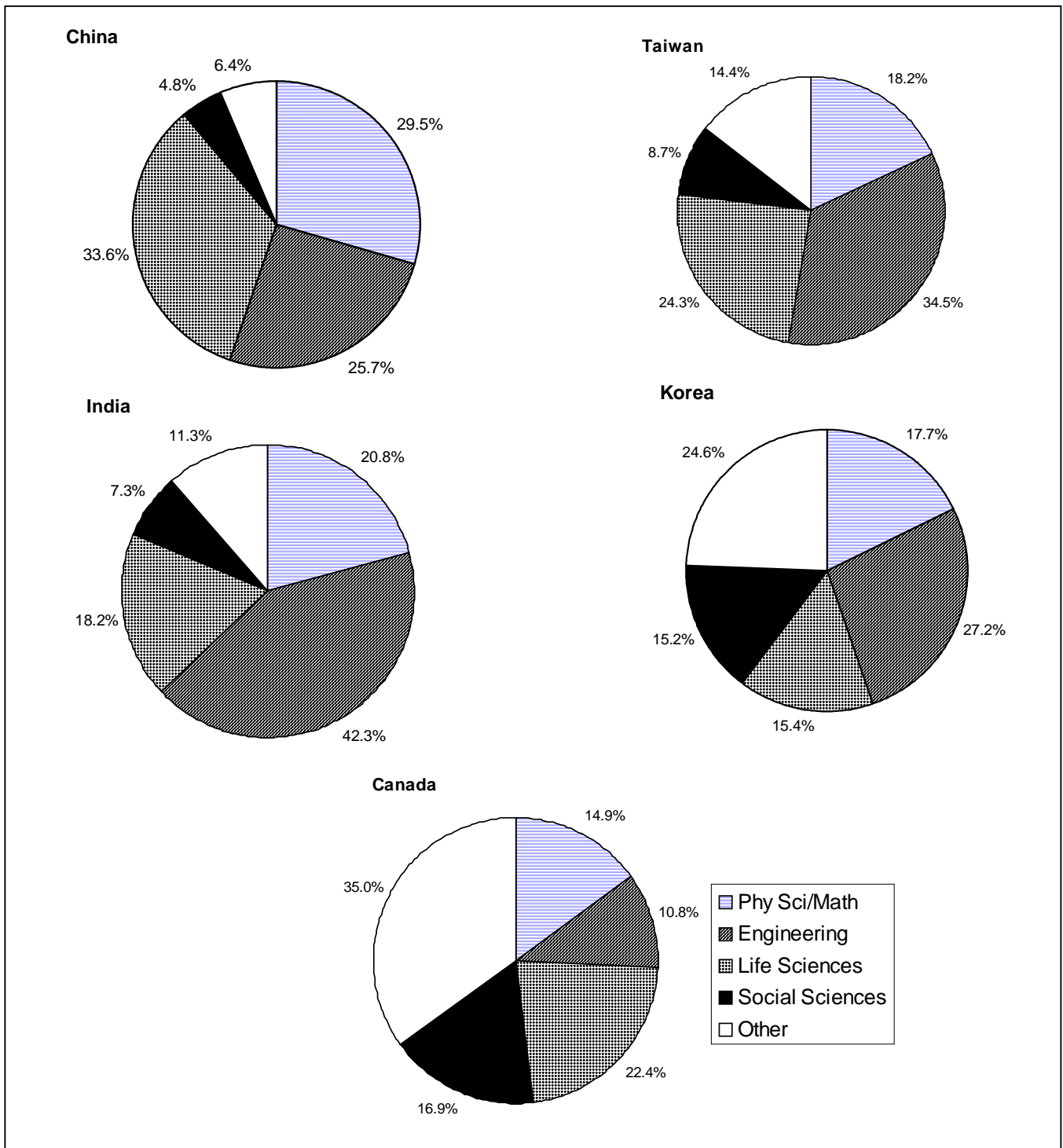
See Table 2-7, Page 74.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

Because international doctoral students are more concentrated in S & E disciplines than are U.S. students, and they vary in terms of representation within those four broad fields, such disproportionate representations must be factored into consideration of other dimensions of the student and the process. For example, graduate financial aid, sex, time to degree, and postgraduate decisions all vary by broad field of study. The differences by citizenship observed may simply reflect the choice of major field.

For the five largest countries of origin for non-U.S. citizen doctorate recipients—China, Taiwan, India, Korea, and Canada—30.2 percent of the degrees were awarded in engineering, followed by the life sciences (24.9 percent) and physical sciences (22.7 percent), although there is considerable variation among countries (see Figure 2-9).

**Figure 2-9**  
**Distribution of international doctorate recipients by**  
**broad field of study for leading countries of origin, 1997**



See Table 2-8, Page 75.

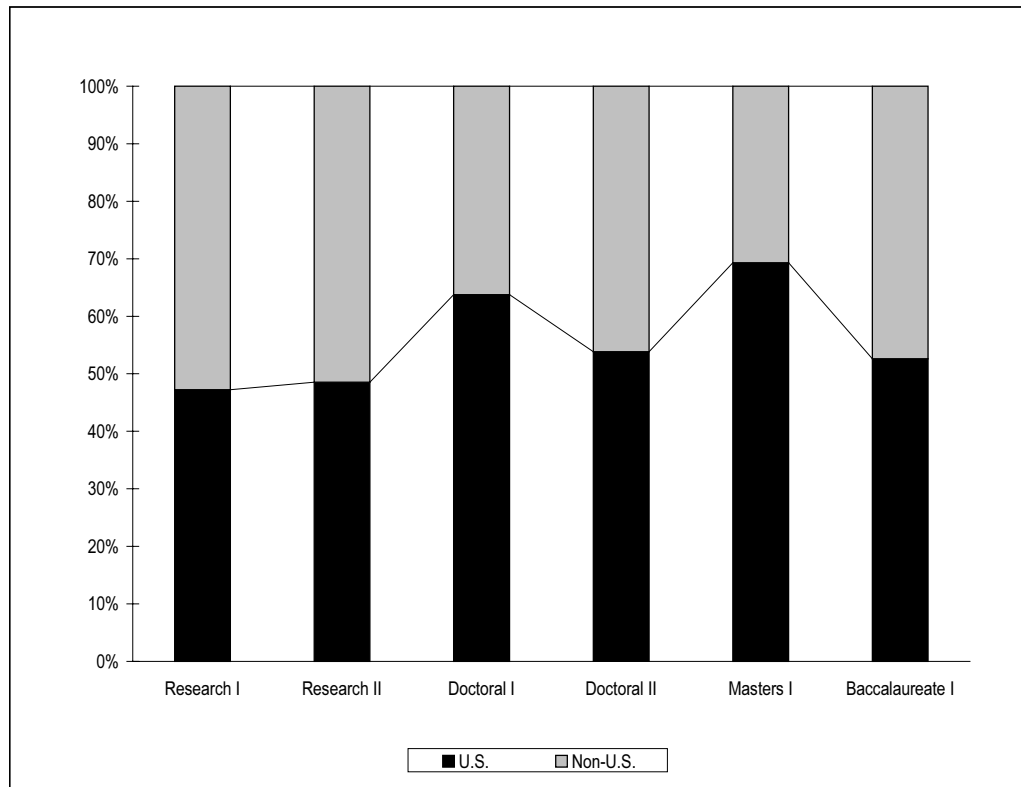
SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

**Distribution by Institution.** More than two-thirds (67.4 percent) of all doctorate recipients earn their degrees at one of the 88 Research I (Carnegie classification) institutions. The 1997 SED data reveal that international students are more likely to receive their Ph.D.s from Research I universities than are U.S. citizens, 73.5 percent to 66.7 percent, respectively. (See Figure 2-10.) While 30 institutions account for approximately 35 percent of all doctorates awarded annually, the concentration is significantly higher for non-U.S. citizens: 30 institutions grant 50 percent of all doctorates awarded to international students, with the University of Wisconsin-Madison and the University of Texas-Austin having the largest totals. (See Table 15A for the top 25 institutions in terms of the absolute numbers of international doctorates awarded.) In terms of proportions of international doctorates, 18 institutions granted more than 50 percent of their doctorates to non-U.S. citizens; of those awarding at least 25 doctorates, New Jersey Institute of Technology and Polytechnic University in New York had the largest percentage of international doctorates. (See Table 15B.)

International students may be disproportionately represented in Research I universities for many reasons, including perceived prestige or name recognition abroad, size of the institution, the possibility of more financial aid, and/or simply because of the academic fields represented in Research I institutions. For example, if Research I universities have larger programs in the S & E fields, the fields in which international students are more likely to be enrolled (because of their own or their home countries' preferences), this could produce the observed skewness. Indeed, 74.5 percent of all S & E doctorates are awarded by Research I institutions; for doctorates granted in non-S&E fields, Research I institutions grant 61.7 percent.

**Time to Degree.** However time to degree is measured—elapsed time since the baccalaureate (TTD), registered time in the doctoral program (RTD), or age at receipt of the doctorate—international students (those with temporary visas) take 1-2 years less than U.S. citizens and permanent residents. The aggregate numbers are 10.7 years for U.S. citizens, 11.3 years for permanent residents, and 9.7 years for those holding temporary visas. Once these figures are corrected for field of study, the field-specific TTD figures converge and/or change rankings. In all four broad S & E fields, TTD is less for U.S. citizens than for either permanent residents or temporary visa holders. The same holds for RTD. (See Table 17.)

**Figure 2-10**  
**1997 Ph.D. recipients by degree-granting institution's**  
**Carnegie classification and by citizenship status**



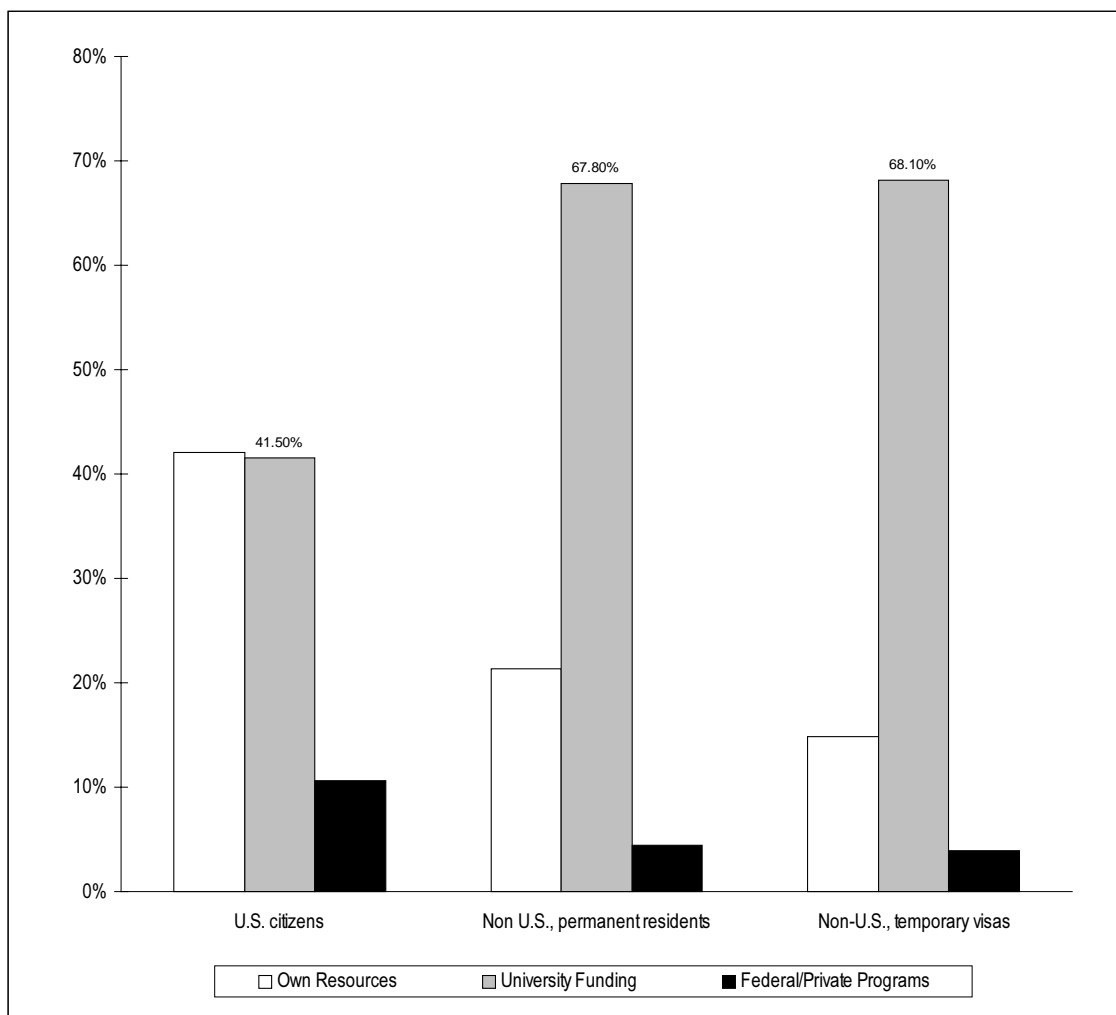
See Table 2-9, Page 75.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

The same pattern emerges when considering average age at award of the doctorate. For example, the median age at receipt of doctorate for international students is 32.3 years; for U.S. citizens and permanent residents, the median age is 34.2 and 34.0 years, respectively. With regard to dispersion around that median, overall about a fourth of doctorate recipients received their degree at least 15 years after completing their baccalaureate work; about 32 percent of U.S. citizens and permanent residents had an elapsed time of 15 years or more, compared with 8 percent for those holding temporary visas. Within S & E fields, U.S. citizens and permanent residents seem to be disproportionately represented in the tails of the distributions—a higher percentage finish within 6 years of the baccalaureate and a larger percentage also take at least 15 years; international students are more concentrated in the middle ranges. The extent to which this reflects differences in focus, financial constraints, or visa restrictions cannot be discerned from the data.

**Financial Support.** Overall, 34.5 percent of doctorate recipients reported using their own resources (including spousal and family)—loans, savings, and part-time non-academic earnings—as the primary source to finance their doctoral studies. More than half of them (53.9 percent) received the majority of their support from program- or institution-based sources (university fellowships, and teaching and research assistantships). Federal, state or foreign government and employer contributions account for the remainder (11.5 percent). (See Figure 2-11 and Table 19.)

**Figure 2-11**  
**Primary source of support by type of citizenship**  
**for 1997 Ph.D. recipients**



See Table 19, Page 64.

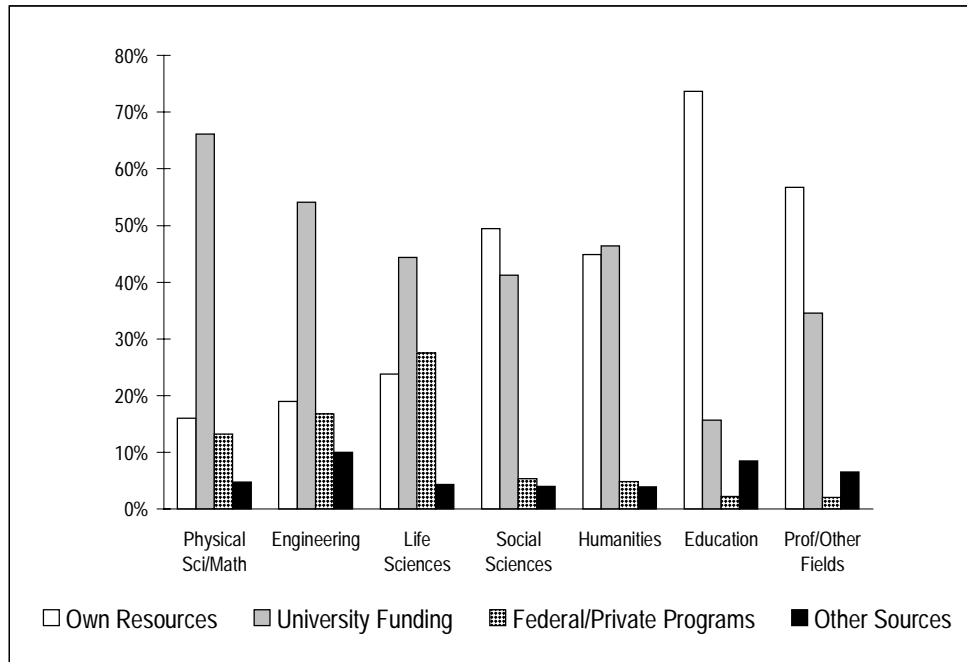
SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

Non-U.S. citizen doctorate recipients reported higher rates of support through university-based funding than did U.S. students: 72.2 percent of students with permanent visas and 71.0 percent of students on temporary visas reported receiving university fellowships, teaching assistantships, or research assistantships as their primary source of graduate financial aid. U.S. citizen doctorate recipients listed those sources only 46.7 percent of the time. (See Table 19.) Since international students are not eligible for such sources of graduate support as NIH traineeships, NSF fellowships, and other national fellowship competitions, and in many instances spouses are also not allowed to work, their reliance on institutional support is not unexpected. Furthermore, visa application regulations preclude an international student being able to meet cost-of-education requirements with borrowing or off-campus employment. The implication of these restrictions is that program- or university-based financial aid is guaranteed at the outset. In addition, international students are more heavily concentrated in the S & E fields, where the vast proportion of doctoral students receive support; teaching and research assistantships are the traditional sources in those fields.

Overall, 42.1 percent of U.S. citizen doctorate recipients reported that their own resources constituted their principal means of support. Within broad field area, this source was listed by only 15.8 percent of American doctoral students in the physical sciences, by 18.4 percent in engineering, and by 23.5 percent in life sciences. On the other hand, 49.3 percent of domestic social sciences doctoral students and 45.5 percent of U.S. students in the humanities relied principally on their own (and/or family) financial resources. For permanent residents and those on temporary visas in the physical and life sciences and engineering, personal and/or family resources were the main source of support less than 10 percent of the time. (See Figure 2-12 and Table 19.)

In terms of program- or institutional-based aid, in the physical and life sciences and engineering, about one-fourth of U.S. students (25.6 percent), permanent residents (24.4 percent), and those on temporary visas (27.2 percent) relied on teaching assistantships as the principal source of support. U.S. citizens were more likely to hold university fellowships, while non-U.S. citizens were more likely to have research assistantships. In the humanities and social sciences, where teaching assistantships are the most prevalent form of support, the distribution of support by citizenship category is remarkably similar, with approximately 60 percent of students receiving their main graduate financial aid from this source; only about one-fourth held university fellowships, and one-sixth were given research assistantships.

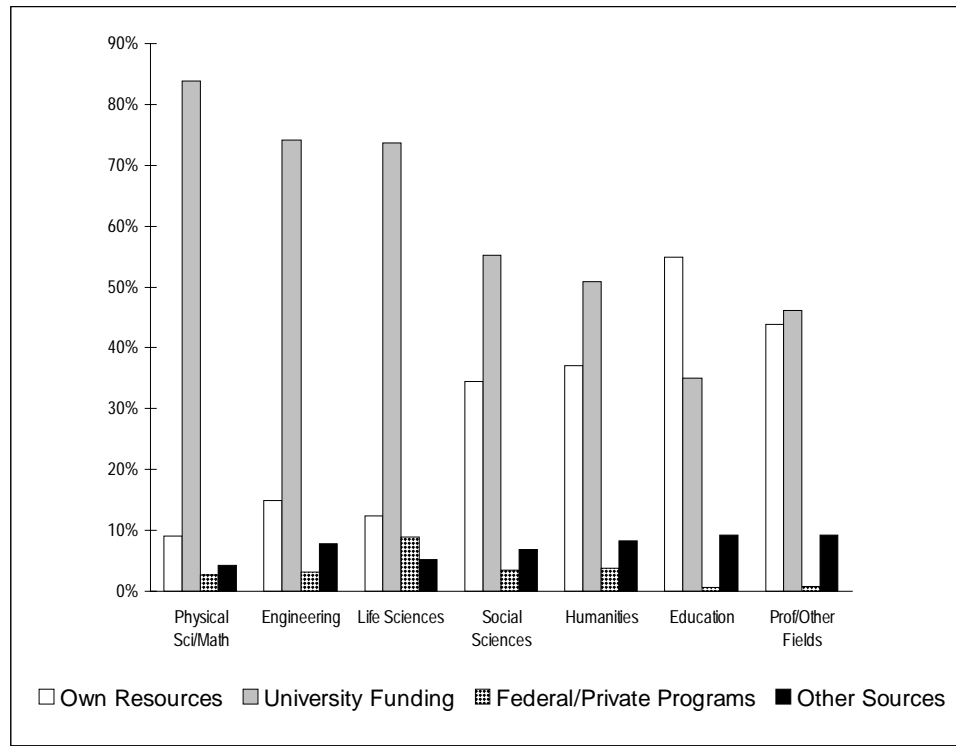
**Figure 2-12A**  
**Primary source of support by broad field for**  
**U.S. citizen 1997 Ph.D. recipients**



See Table 19, Page 64.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

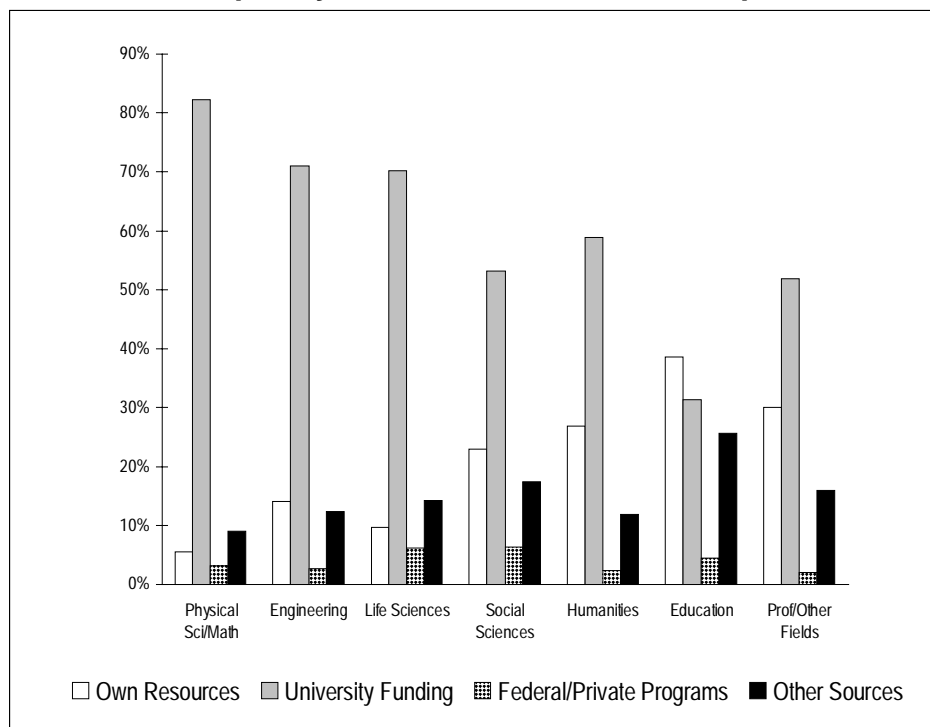
**Figure 2-12B**  
**Primary source of support by broad field for**  
**non-U.S. permanent resident 1997 Ph.D. recipients**



See Table 19, Page 64.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.

**Figure 2-12C**  
**Primary source of support by broad field for**  
**non-U.S. temporary visa holder 1997 Ph.D. recipients**



**Postgraduation Plans.** Of the 9,803 non-U.S. citizen doctorate recipients who provided a postdoctoral location, 68.8 percent indicated that they would remain in the United States for employment or continuing study; of those with definite commitments, 73.6 percent intended to remain in the United States—97.7 percent for permanent residents and 67.5 percent of those on temporary visas. (see Tables 26 and 27).<sup>6</sup> However, this incidence differed by country of citizenship, ranging from a high of 95 percent for China and 91 percent for India down to 39 percent for Korea. In absolute numbers of international doctorate recipients planning to remain in the United States immediately after receipt of the degree, the five countries with the largest numbers were China (1,976); India (1,131); Taiwan (639); Korea (387); and Canada (239). (See Figure 2-13.)

Whereas one-fourth of U.S. citizen doctorate recipients with definite commitments indicated that they were continuing their studies after receipt of the Ph.D., 33.8 percent of permanent residents and 39.0 percent of those holding temporary visas reported immediate plans for study instead of employment. Of those planning to remain in the United States, 34.9 percent of permanent residents and almost half (48.3 percent) of those on temporary visas indicated plans for postdoctoral study rather than employment as their immediate commitment. (See Tables 26 and 27.)

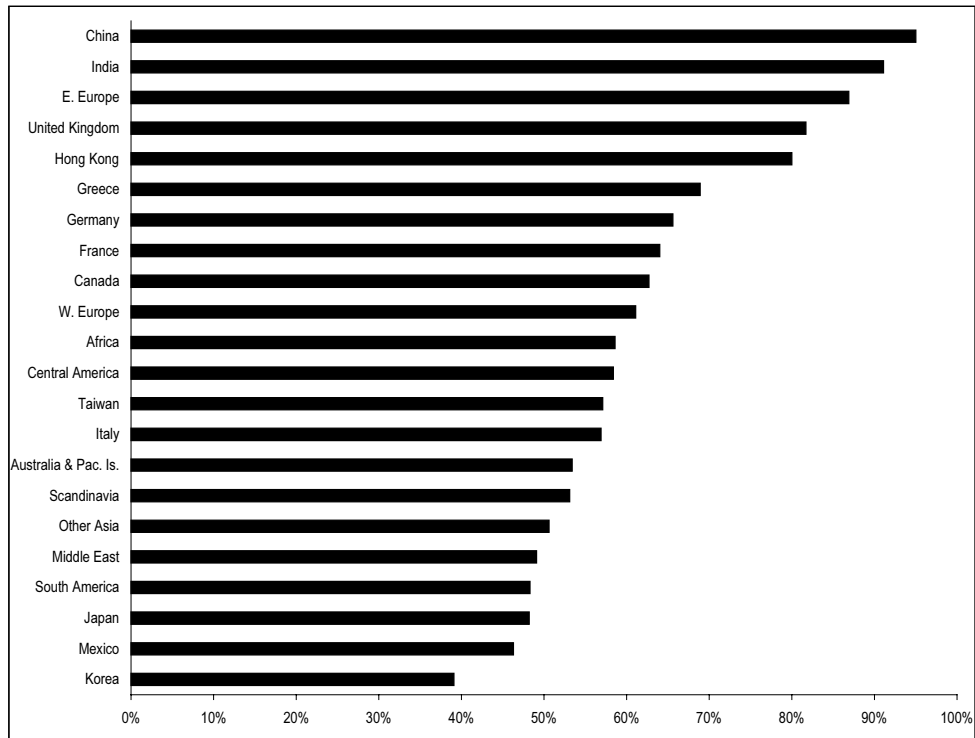
About 27 percent (2,661) of non-U.S. citizen doctorate recipients indicated plans to return to their home country. Of the nearly 10,000 international doctorate recipients who indicated a postdoctoral location, fewer than 400 (395) of those not returning to their home country were bound for somewhere other than the United States; in other words, 94.5 percent of the non-U.S. citizen doctorate recipients planned to remain in the United States.

Only Korea and Mexico had immediate “return rates” that exceeded 50 percent (59.5 percent and 51.0 percent). China and India had the lowest return rates (2.2 percent and 5.6 percent) of any country.

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<sup>6</sup> With respect to postdoctoral activity and location, the survey does not distinguish short-term versus long-term plans or expectations. An “immediate” plan or commitment could thus be temporary.

**Figure 2-13**  
**Percent of 1997 Ph.D. recipients who report U.S. as**  
**postdoctoral location by country of citizenship**



See Table 2-10, Page 76.

SOURCE: NSF/NIH/NEH/USED/USDA, Survey of Earned Doctorates.